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HANDBOOK OF INSTRUCTIONS
OPERATION AND MAINTENANCE

RADIO RECEIVERS
BC-341-F and BC-357-H

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2. NAME PLATE DATA
3. DATE AND NATURE OF FAILURE
4. TYPE OF AIRPLANE IN WHICH INSTALLED
5. RECOMMENDATIONS

NOTICE

This Instruction Book has been divided into two parts. PART A to cover RADIO RECEIVER BC-341-F (12 volt) and PART B to cover RADIO RECEIVER BC-357-H (24 volt.)

Except for the difference in filament voltage required and a by-pass condenser in Radio Receiver BC-341-F, these two models are identical.

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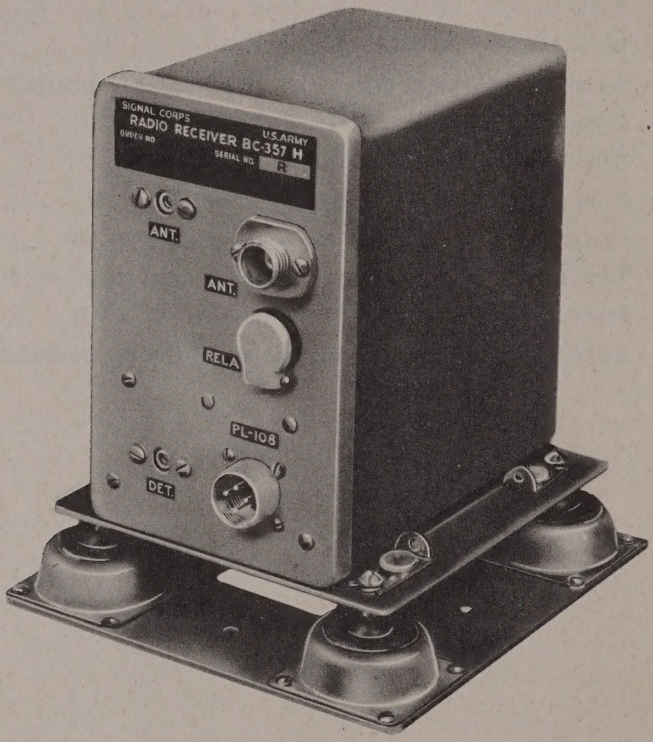


Figure 1 — RADIO RECEIVER BC-357-H IN CASE ON MOUNTING FT-161, DIAGONAL FRONT VIEW

PART A

RADIO RECEIVER BC-341-F
(12 VOLT)

SECTION I. GENERAL CHARACTERISTICS

1. Description of Receiver

a. Radio Receiver BC-341-F is an ultra high frequency receiver for aircraft use. The frequency range is from approximately 62 megacycles to 80 megacycles. The purpose of the instrument is to receive 75 megacycle marker beacon signals of the Army instrument landing system, the Civil Aeronautics Administration cone of silence, fan marker beacon and other facilities employing modulated 75 megacycle horizontally polarized transmissions.

b. The receiver uses the following tube complement: duplex diode pentode Tube VT-153 and duplex diode triode Tube VT-104. The complete receiver is shown in figures 1, 5 and 6. Tube VT-153 functions as a radio frequency amplifier, detector and audio frequency amplifier. Tube VT-104 functions as an audio frequency amplifier and rectifier which supplies the relay current.

c. The sequence of operation upon the received modulated signal is as follows:

(1) Pick-up by the half wave antenna.

(2) Amplification at 75 megacycles, diode detection, and a-f amplification by the first tube.

(3) Additional amplification and rectification of the audio signal by the second tube to produce the direct current for operation of the relay which controls the lamp circuit.

2. Power Requirements

Radio Receiver BC-341-F receives its high and low voltage power from the radio compass power supply. This power is controlled by the "ON-OFF" switch on the radio compass. Power required by Radio Receiver BC-341-F is 0.3 amperes at 12 volts for the filament supply, and 7 milliamperes at 220 volts for the plate supply. There is also a small amount of power used intermittently by the indicator lamp on the instrument panel.

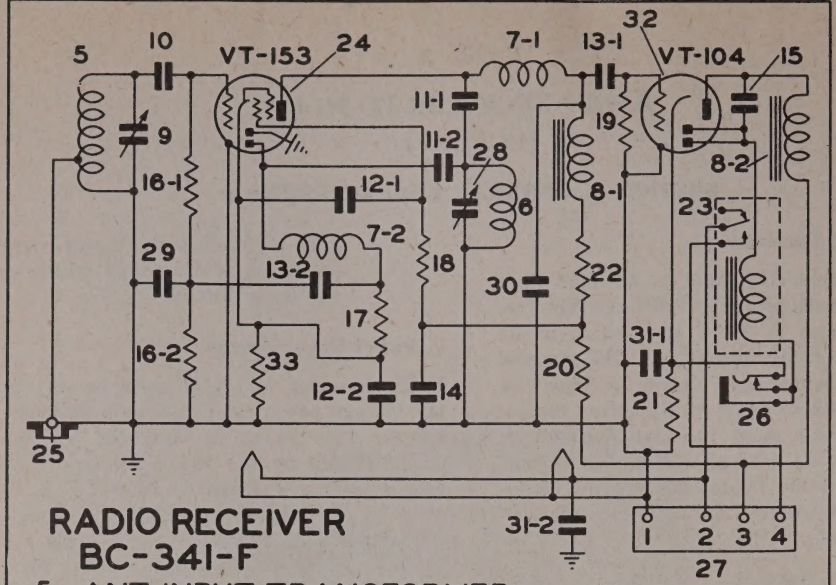
3. Component Parts

Radio Receiver BC-341-F consists of the component parts listed in alphabetical order below:

Quantity	Description	Dimensions	Unit Weight (lbs.)
1	Mounting FT-161	5½" x 5⅞" x 1½"	0.5
1	Radio Receiver BC-34-F less mounting	5⅜" x 5⅜" x 3 7/16"	2.65
1	Tube VT-104	2⅝" x 1⅜"	0.071
1	Tube VT-153	3¼" x 1⅜"	0.065

4. Weight

The weight of Radio Receiver BC-341-F, including mounting bracket and tubes, is 3.25 lbs.



RADIO RECEIVER BC-341-F

5	ANT. INPUT TRANSFORMER	
6	DETECTOR TUNING COIL	
7	R.F. CHOKE (2 REQ'D.)	
8	AUDIO CHOKE (2 REQ'D.)	
9	TUNING CAPACITOR, 17 MMF.	
10	CAPACITOR, CERAMIC 15 MMF.	
11	CAPACITOR, CERAMIC 50 MMF. (2 REQ'D.)	
12	CAPACITOR, MICA .004 MFD. 500 V. (2 REQ'D.)	
13	CAPACITOR, MICA 1500 MMF. 500 V. (2 REQ'D.)	
14	CAPACITOR, PAPER 0.5 MFD. 400 V.	
15	CAPACITOR, PAPER .034 MFD. 600 V.	
16	RESISTOR, 1 MEGOHM	1/4 W. (2 REQ'D.)
17	RESISTOR, 560.000 OHM	1/4 W.
18	RESISTOR, 270.000 OHM	1/4 W.
19	RESISTOR, 2.2 MEGOHM	1/4 W.
20	RESISTOR, 22.000 OHM	1/2 W.
21	RESISTOR, 1000 OHM	1/4 W.
22	RESISTOR, 6800 OHM	1/4 W.
23	RELAY	
24	TUBE SOCKET	
25	ANTENNA JACK	
26	RELAY JACK	
27	SOCKET SO-88	
28	DETECTOR TUNING CAPACITOR, 17 MMF.	
29	CAPACITOR, MICA 150 MMF. 500 V.	
30	CAPACITOR, MICA 75 MMF. 500 V.	
31	CAPACITOR, MICA 500 MMF. 500 V. (2 REQ'D.)	
32	TUBE SOCKET	
33	RESISTOR, 560 OHM	1/4 W.

Figure 2 — SCHEMATIC CIRCUIT DIAGRAM, RADIO RECEIVER BC-341-F

SECTION II. EMPLOYMENT

5. Initial Procedure

a. Check to determine that all component parts as listed in Paragraph 3, Section I, are available.

b. Insert the tubes in the proper sockets and check to make sure that socket contacts and tube prongs are in full engagement. Insure a firm contact for the grid lead to the cap of Tube VT-153.

c. Examine the receiver for mechanical defects and make sure that the chassis cover is secured to the chassis.

6. Installation

a. Choose the location of Radio Receiver BC-341-F in the aircraft by consideration of the following factors:

(1) Accessibility for tube replacement, tuning, and relay adjustment. This is an important consideration, because the receiver is subject to frequent test and inspection.

(2) Accessibility to power supply through the cable supplied with the aircraft by the manufacturer.

(3) Proximity to the antenna location. The length of the antenna transmission line is not critical, however.

b. Permanently fasten Mounting FT-161 in its chosen location in the aircraft. Fasten the receiver securely to the mounting, making sure that the snap slides are properly engaged and "safety-wired" to the posts of the mounting.

c. Connect the antenna plug to the socket marked "ANT." Connect the power plug to the socket marked Plug PL-108. Tighten both plugs securely, making sure they seat properly.

d. Radio Receiver BC-341-F may be used as a part of Marker Beacon Receiving Equipment RC-39-A or RC-39-B. Other important parts of this equipment are the antenna and transmission line. Consult the instruction book for Marker Beacon Receiving Equipment RC-39-A or RC-39-B in order to get a complete knowledge of all the components of the equipment concerned.

7. Preparation for Use

a. After the receiving equipment has been installed and all the connections made, proceed as follows:

(1) Turn on the radio compass. This supplies the power for Radio Receiver BC-341-F. Wait about one minute for the tubes to warm up.

(2) Apply a test signal to the receiver and check the tuning. This is done with Test Set I-76. (For a complete description of Test Set I-76 see the instruction book for that equipment.) Proceed as follows:

(a) Set test oscillator on the ground to the side of the aircraft about 10 to 20 feet from the radio receiver antenna. The test oscillator antenna should be extended to its full length and set parallel with the radio receiver antenna. The battery switch should be turned "ON" and the modulation set for 3,000 cycles.

(b) Connect Test Indicator BE-67 which is also part of Test Set I-76 to the output of the receiver by plugging one end of the cord, provided with Test Set I-76, into the jack, marked "RELAY" on the front of the radio receiver. The other end of the cord is plugged into the jack of the test indicator. Set the switch on the test indicator to the "TUNE RECEIVER" position, and the milliammeter will indicate the output current of the receiver when the latter is properly aligned and normal. If no indication is obtained, check the oscillator and refer to the instructions pertinent to the adjustment of that instrument.

(c) Use a screwdriver with a $\frac{1}{8}$" blade for tuning the "ANT" and "DET" tuning capacitors. Tune for maximum response on the test indicator. If the "ANT" adjustment is

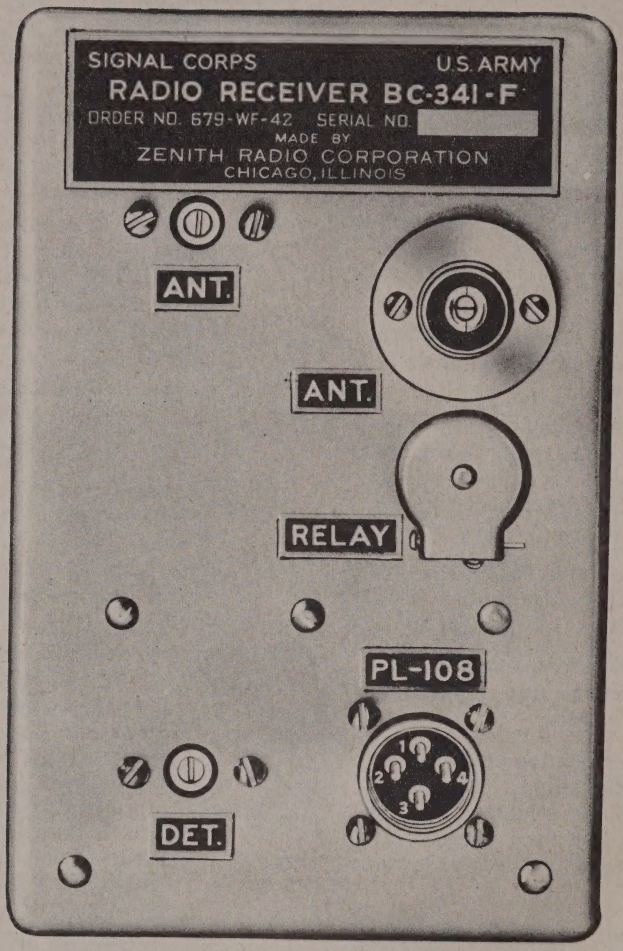


Figure 3 — RADIO RECEIVER BC-341-F, FRONT VIEW

very far off it is desirable to check from one to the other a couple of times and then tune "DET" last. If the output response exceeds 0.5 ma at the maximum response, decrease the length of the antenna on the test oscillator by collapsing the sections, or place the test oscillator at a more remote point. Rotation of the oscillator will also accomplish the same result. There should be no moving object in the vicinity of the test oscillator or the marker beacon antenna while the tuning adjustment is in progress. This tuning adjustment should always be made with the receiver chassis in its case.

(3) Remove test signal and check relay as follows:

(a) Hold the switch on Test Indicator BE-67 in the "ADJUST RELAY" position.

(b) Turn the control knob on the test indicator clockwise until the marker beacon indicator light goes on, and then turn the knob back until the light goes off. The relay should close at 0.4 milliampere (± 10%), as read on the meter in the test indicator, and open at 0.2 milliampere (± 10%). The procedure outlined in Paragraph 15 should be followed if the relay needs adjustment.

(c) After Test Indicator BE-67 has been disconnected, the receiver is ready for operation.

(d) Turn the test oscillator on, and observe that the indicator lamp on the instrument panel lights after the test indicator has been removed. This is a check that the jack circuit properly closes after the plug has been removed.

8. Operation

a. Radio Receiver BC-341-F is used by the pilot to determine when he is flying over a 75 megacycle marker beacon transmitter. Such a transmitter might be an Army instrument landing type such as Radio Transmitter BC-302 or Marker Beacon Projector A-1. When used with such transmitters for blind landing, the receiver gives the pilot distance indication from the end of a runway. For complete information as to how the receiver is used in such a situation, see instructions for the Army A-1 Landing System. Signals from fan type markers and cone of silence transmitters may also be received along commercial airways. The former type of marker gives the pilot an indication of his distance from an airport as he approaches along the radio range. Signals from the cone of silence transmitter tell the pilot when he has reached a point above the airport.

b. The receiver will respond to any audio-modulated 75 megacycle signal. The sensitivity of the receiver increases as the modulation frequency increases up to 3,000 cycles modulation to five normal output. This permits use of the receiver with the powerful 60 cycle modulated Army instrument landing system transmitters, without making it insensitive to the less powerful cone of silence transmitters.

c. The radio receiver indicator lamp will indicate during varying intervals, depending upon the type of marker, the altitude and speed of the airplane. Equal indications for any direction of flight are given over cone of silence markers. These last about one minute at 10,000 feet altitude, when the speed of the airplane is 150 miles per hour.

d. Radio Receiver BC-341-F is designed to minimize false or confusing signals caused by stray radiations, natural or man-made static, ignition interference or vibration.

e. Turning the radio compass switch "ON" is the only step required to bring Radio Receiver BC-341-F into operation. No other adjustments are required while the equipment is in use. Since the receiver has no power supply switch, other than the radio compass "ON-OFF" switch, the receiver and radio compass are always in operation together.

9. Precautions During Operation

a. To avoid faulty use of the equipment and misrepresentation of results, observe the following precautions:

(1) Receiver operates only with the radio compass switch in the "ON" position.

(2) When passing over a marker, the indication will be steady or intermittent depending upon whether or not the transmitter is keyed. Cone of silence markers and some Army instrument landing markers are not keyed. Keying is used to identify fan type and Civil Aeronautics Administration instrument landing markers. However, if the receiver does not follow the keying of a 100 watt fan marker transmitter when the airplane is passing through the strongest part of the beam at low altitudes, it does not indicate any fault in the receiver.

(3) Flickering of the indicator lamp which might be misinterpreted as a keyed signal may be caused by a defect in the antenna installation, microphonic tubes, or ignition interference.

SECTION III. FUNCTIONING OF PARTS

10. Radio Receiver BC-341-F

a. Referring to the schematic diagram, Figure 2, the ultra high frequency signal (75 megacycles) picked up by the antenna is fed to the input r-f transformer 5 through a concentric transmission line. The ultra high frequency voltage induced in the r-f transformer is impressed on the control grid of Tube VT-153 by means of capacitor 10 and grid resistor 16-1 (grid resistor 16-2 is effectively by-passed at radio frequency by capacitor 29). The ultra high frequency variations of plate current of Tube VT-153 caused by the signal voltage impressed on the control grid produces a radio frequency voltage across r-f choke 7-1 which is impressed on the diode plate by means of coupling capacitors 11-1 and 11-2 and r-f choke 7-2. The advantage of tuned circuit 6-28 is to give the receiver greater selectivity. The radio frequency signal is rectified by the diode. The audio frequency voltage produced across resistor 17 is coupled back to the grid of Tube VT-153 by means of capacitor 13-2 and resistor 16-2. Resistor 16-1 can be considered in series with the control grid when the tube functions as an audio frequency amplifier. The audio frequency variations of plate current flowing through audio choke 8-1 and resistor 22 produce an audio frequency voltage which is impressed on the grid of Tube VT-104 by means of coupling capacitor 13-1 and grid resistor 19. The audio frequency voltage produced across audio choke 8-2 is impressed on the diode plate of Tube VT-104 by means of capacitor 15, and the coil of relay 23 which functions as the diode load. The rectified audio frequency current flowing through the relay coil operates the relay, the contacts of which close the circuit of the radio receiver indicator lamp.

THE WIRING ON THIS BC-341-F IS SURE "HAYWIRE" - I THINK I'LL CLEAN IT UP!
BETTER STICK TO THE ORIGINAL LAYOUT IF YOU WANT IT TO WORK- THAT HIGH FREQUENCY STUFF IS TRICKY!
CONSULT ANOTHER RECEIVER OR PHOTO WHEN REPLACING PARTS OR WIRING IN THE BC-341-F OR BC-357-H. FOLLOW THE ORIGINAL LAYOUT EXACTLY.

b. At ultra high frequencies it is necessary to regard the wiring of the ultra high frequency circuits as an appreciable part of the circuit constants. As an illustration, the lead from pin No. 1 of Tube VT-153 socket to the chassis ground, although less than one inch in length is an inductance, and its actual length and position have considerable effect on the radio receivers sensitivity and stability. Due also to the reflex circuit connections there exists some feed-back which is regenerative. This feed-back tends to cancel out the transit time effect of Tube VT-153 when used as an ultra high frequency amplifier, and results in improved sensitivity and selectivity. The amount of this feed-back depends on the exact length of wiring and by-passing associated with the first tube as well as the circuit constants themselves. For this reason whenever parts are replaced, another receiver or the photographs of the instruction book must be used as reference and the exact lengths and positions of the leads duplicated. Design details which may seem unconventional are essential to the stability of the receiver.

c. One of the requirements of this receiver is that it must be relatively insensitive for use with the 20 watt, 60 cycle modulated marker beacon transmitter of the Army instrument landing system, yet provide maximum sensitivity for use with the 5 watt, 3,000 cycle modulated cone of silence mark-

ers on the civil airways. For this reason the constants of the audio frequency coupling circuits have been chosen to discriminate against the lower audio frequencies and to provide maximum amplification at 3,000 cycles. Coupling capacitors 13-1 and 13-2 have a comparatively low value for this reason. Also, it will be noted that audio choke 8-1 has a very high impedance at 3,000 cycles which causes Tube VT-153 to be very efficient as an audio amplifier at 3,000 cycles. The impedance of audio choke 8-1 is, of course, comparatively low at 60 cycles. However, resistor 22 (6800 ohms) is a part of the plate load, which does not discriminate against the low audio frequencies.

d. The space current (plate current plus screen grid current) of Tube VT-153 flowing through resistor 33 supplies the grid bias for the tube. By-pass capacitor 12-2 is of a comparatively low value. Thus resistor 33 has a slight degenerative effect at audio frequencies.

e. Resistor 20 and capacitor 14 act as a filter circuit in the high voltage supply to Tube VT-153. This filter serves to prevent hash or ripple which might be present in the high voltage supply, from operating the relay. The characteristics of filters 20 and 14 are such as to render negligible the effect of 3 volts of audio ripple in the band 40 CPS to 3,000 CPS in the high voltage supply.

f. The screen grid potential is supplied through resistor 18. Capacitor 12-1 functions as a by-pass for the screen grid circuit.

g. Compensation for change in temperature is provided by capacitors 10, 11-1 and 11-2, which are of the temperature compensating ceramic type.

h. Both Tube VT-153 and Tube VT-104 have 12.6 volt heaters. These heaters are connected in parallel in this set.

i. The relay designated as part 23 in the schematic diagram, is shown in Figure 9. The closing current is 0.4 ma. Release occurs when the current drops to 0.2 ma. The adjustment should always be made carefully in accordance with the instructions given in paragraph 15, under Maintenance. The armature travel is determined by screws S_1 and S_2 which should be adjusted very carefully. The tension on the armature which pivots about point O is regulated by a third set screw S_3 acting upon the spring SP. A_1 and A_2 are the terminals for the relay coil windings. Terminals B_1 and B_2 are the terminals for the secondary circuit which the relay closes to operate the marker beacon indicator lamp. Terminal B_3 is not used.

j. Tuning adjustments on the receiver are made by varying capacitors 9 and 28. These are marked "ANT" and "DET" respectively on the front panel. The positions of these capacitors are shown in Figure 3.

11. Vacuum Tubes

a. Two tubes are employed in Radio Receiver BC-341-F. The function and characteristics of the vacuum tubes required appear in the table below:

Tube	VT-153	VT-104
Function	Pentode r-f Amp. Diode Det. First a-f Amp.	2nd Audio Amp. Diode Rect.
Heater v	12.6	12.6
Heater a	.15	.15
Esg. v	125 max	—
Ep v	250 max	250 max
Ecg v	—3	—2
Ip ma	9.0	0.9
Isg ma	2.3	—
Mu	730	100
Rp ohms	650,000 normal	91,000
Gm umhos	1,125	1,100

NOTE: These data are the characteristics of the tubes as listed commercially, and except for heater voltage do not necessarily indicate the actual values in operation in the equipment.

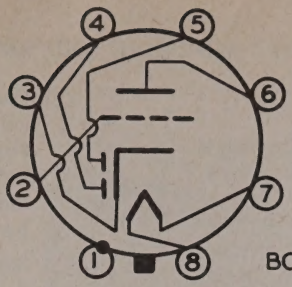


Figure 4 — TUBE VT-104, DUPLEX-DIODE TRIODE

(1) METAL SHELL CONNECTION
(2) CONTROL GRID
(3) CATHODE
(4)(5) DIODE PLATES
(6) PLATE
(7)(8) HEATER

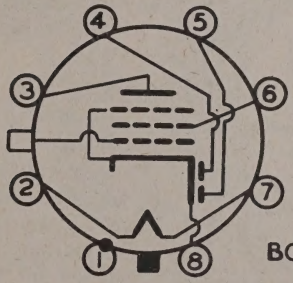


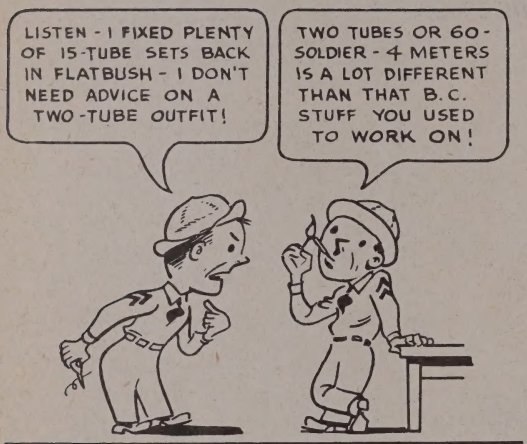
Figure 5 — TUBE VT-153, DUPLEX-DIODE PENTODE

(1) METAL SHELL CONNECTION
(2)(7) HEATER
CONTROL GRID CONNECTED TO CAP OF TUBE
(3) PLATE
(4)(5) DIODE PLATES
(6) SCREEN GRID
(8) CATHODE

SECTION IV. SERVICING AND REPAIR

12. Maintenance

Radio Receiver BC-341-F, an ultra-high frequency device, imposes greater restrictions on maintenance and requires more particular servicing than do ordinary tuned radio frequency receivers. However, since the receiver is relatively simple, the precautions to be observed are few though stringent. The maintenance of the radio frequency portion of this receiver demands care. At ultra-high


LISTEN - I FIXED PLENTY OF 15-TUBE SETS BACK IN FLATBUSH - I DON'T NEED ADVICE ON A TWO-TUBE OUTFIT!
TWO TUBES OR 60 - SOLDIER - 4 METERS IS A LOT DIFFERENT THAN THAT B.C. STUFF YOU USED TO WORK ON!
THE RADIO FREQUENCY CIRCUITS OF THE BC-341-F AND BC-357-H REQUIRE MORE THAN ORDINARY CARE BOTH IN MAINTENANCE AND WIRING.

frequencies the length of connection leads and the placement of parts such as coils and capacitors are extremely important. Care should therefore be exercised in replacing parts or leads. The photographs in Figures 6 and 7 must be carefully followed or a standard receiver should be referred to. The circuits connected to Tube VT-153 are the only critical ones in this respect.

13. Service Inspection

a. A periodic inspection should be made as follows:

(1) Tubes should be checked on the best available type of tube tester, preferably on equipment capable of determining the characteristics listed under paragraph 11.

(2) Check the relay closing and release currents according to the procedure outlined in paragraph 10-a of this section. Make any necessary relay adjustments by following the instructions of paragraph 10-b, of the same section.

(3) Align the receiver as indicated in this section, whenever tubes are replaced, or the installation of the antenna structure, including the transmission line is modified or repaired. Always install receiver chassis in its case when the final alignment of the receiver circuits is made.

(4) A flight test should be made over Army instrument landing markers to make sure that the radio receiver is functioning properly when receiving signals from these transmitters.

14. Continuity Tests

a. First remove Plug PL-108 and tubes from their sockets before making continuity tests.

b. Resistors may be checked at their terminals since none are shunted by other components excepting capacitors. Failure to obtain values as designated on the circuit label indicates a defect in the resistor or breakdown of the adjacent capacitor. Adjacent capacitors should be checked immediately for short circuits in the event of failure to obtain correct ohmmeter readings for the resistors.

c. Capacitors should all have resistance values on the order of 10,000 megohms at room temperature — although values as low as 1,000 megohms are satisfactory for service. Measurements across the terminals of all fixed capacitors with the exception of 10, 11-2, 12-1, 13-2 and 31-1 should indicate resistance values beyond the upper limit of the ohmmeter on its highest range. A small kick of the ohmmeter needle when first connecting to the capacitor terminals is due to the surge of charging current. The steady value is the indication of resistance. The kick is an indication of the size of the capacitor and will be

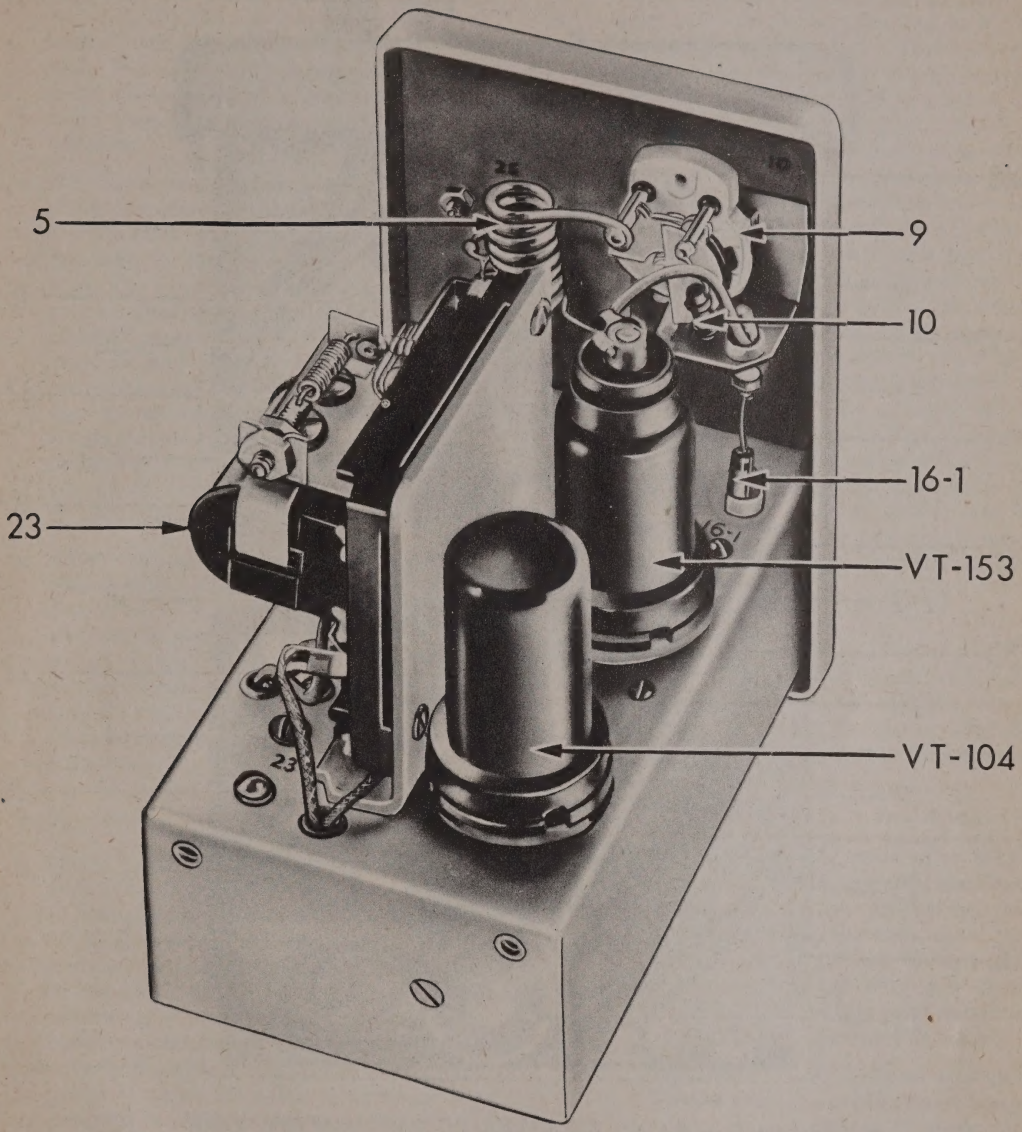


Figure 6 — RADIO RECEIVER BC-341-F, TOP VIEW

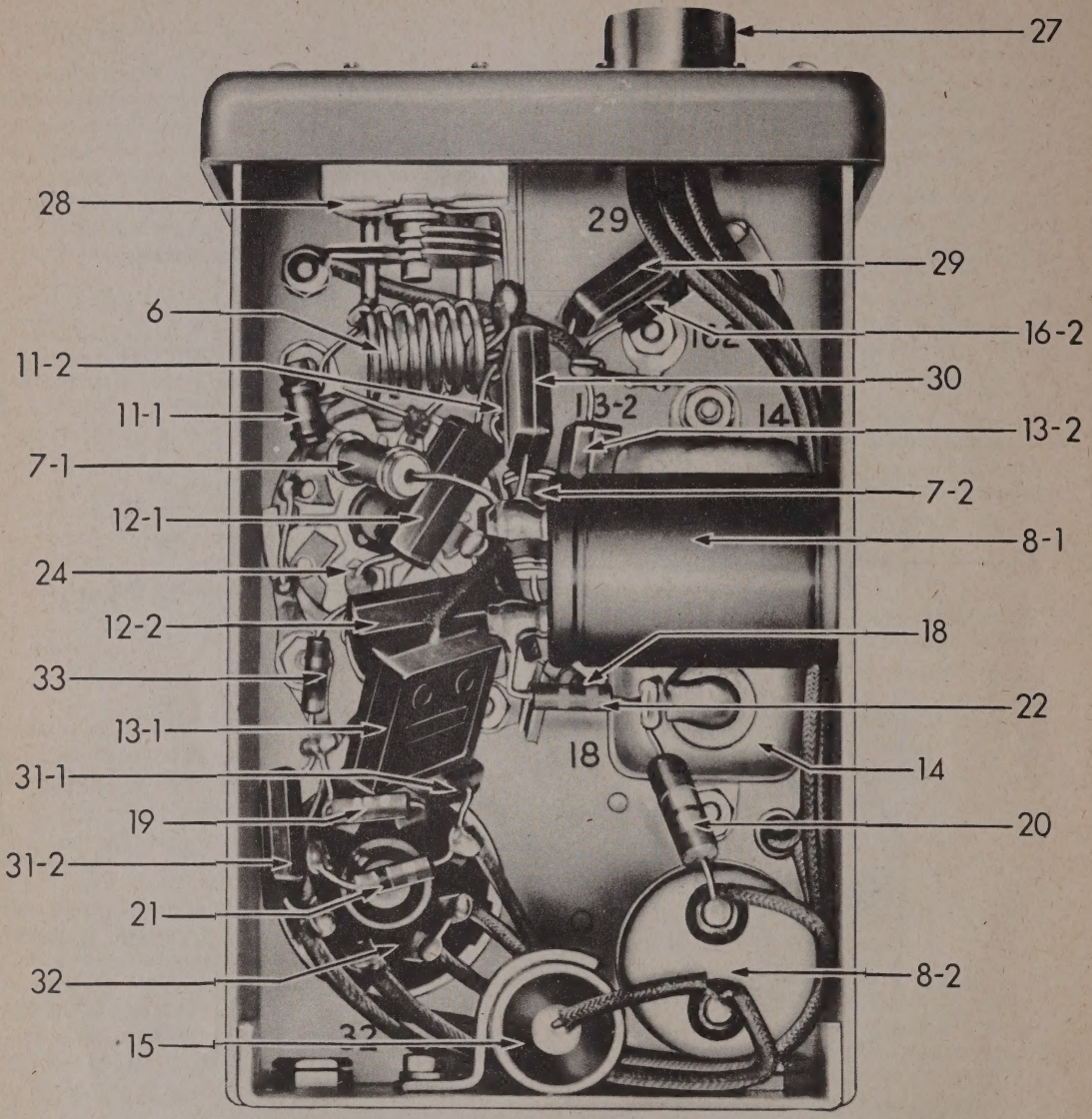


Figure 7 — RADIO RECEIVER BC-341-F, BOTTOM VIEW

observed only with values on the order of .01 mfd or larger and indicates that the capacitor is not open circuited. Capacitors 10, 11-2, 29, 12-1, 13-2 and 31-1 will measure 2 megohms, 0.56 megohms, 1 megohm, 560 ohms, 1.5 megohms and 1000 ohms respectively when measured across their terminals due to the shunting by resistors.

d. R-f input transformer 5 and inductor 6 should be inspected visually to insure that the soldered connections are satisfactory, and that the spacing between turns is uniform. The grid leads to Tube VT-153 should be examined for broken strands and replaced if necessary. The grid clip should be examined to insure a firm grip on the grid cap of the tube. R-f chokes 7-1 and 7-2 may be checked by direct measurement across terminals. They should measure approximately 3.5 ohms each. Audio chokes 8-1 and 8-2 should show a d-c resistance of 1600 ohms each.

e. Relay continuity tests include resistance measurement of the coil which has a nominal value of approximately 13,000 ohms and may be measured at terminals A_1 and A_2 as shown in Figure 10. Contact resistance should be measured between terminals B_1 and B_2 and be negligible when the contacts are closed by light pressure on the armature.

15. Relay Adjustment

a. Check relay by the following procedure: Turn radio compass on and wait for tubes to heat. Connect Test Indicator BE-67 to the radio receiver by means of the cord provided for that purpose. Hold the switch on the panel of the test indicator in the momentary contact or "ADJUST RELAY" position while the control knob is turned to vary the relay current. The current required to close the relay is normally 0.4 milliampere. A deviation of 10 percent is permissible. As the current is reduced, the relay releases at 0.2 milliampere. A deviation of 10 percent in the release current is permissible. If indicator lamp fails to light, remove receiver from case, check lamp circuit and relay contacts. Clean latter if necessary.

b. Readjustment of the relay is accomplished as follows: Insert a sheet of paper of 2 or 3 mils thickness between the armature and relay coil pole pieces. (See Figure 9.) Release screw S_1 and exert a slight pressure on the armature directly above the pole piece. Turn Screw S_1 until contact is just made and indicator light goes "ON." Lock screw S_1 in place, compensating for effect of lash in threads. Still exerting very light pressure against the armature, make sure that the paper can be withdrawn without excessive rubbing. This insures that there is no flexing of the armature and that the air gap is 2 or 3 mils. Adjust the tension of the armature spring SP by means of screw S_3 until release occurs at 0.2 milliampere of relay current. Lock screw S_3. Screw S_2 should now be adjusted so that the relay closing current is 0.4 milliampere. A deviation of plus or minus 10 percent is allowable for both closing and release currents. However, it is important that the difference between the two should not be less than 0.20 milliamperes for best performance in service.

16. Inductances

a. There are four r-f inductances employed in Radio Receiver BC-341-F, bearing designations 5, 6, 7-1, 7-2 on the circuit label. The following table indicates the functions and dimensions of these coils:

Inductance	Use	Description
5	Radio Frequency Input Transformer	8 turns #14 B & S gauge solid tinned copper spaced to cover approximately 1". Tapped at ½ turn from end with #20 B & S gauge solid tinned copper wire ½" O.D.
6	Detector Tuning Coil	5 ⅞ turns #14 gauge solid tinned copper spaced to cover $1\frac{9}{32}$" ½" O.D.
7-1 7-2	Radio Frequency Choke	88 turns enameled copper wire close wound on $\frac{7}{32}$" ceramic form.

b. The a-f inductors employed in Radio Receiver BC-341-F are two in number, bear-

ing designations 8-1 and 8-2 on the circuit label. These inductors are plate chokes for Tubes VT-153 and VT-104 respectively. The manufacturer's rating of these inductances is 23 henries with 3 ma d-c flowing through them.

17. Receiver Sensitivity Measurements

a. The sensitivity of the receiver is measured by the application of a 75 megacycle signal through a 75 ohm dummy antenna load from a signal generator such as Ferris Microvolter Model 18-C with provision for external modulation. The dummy antenna may be an IRC type BT-½, 75 ohm resistor. The resistor must be connected by the shortest length of lead to the ANT jack 25, preferably by means of a Jones type 101-D plug. A 30 percent modulated signal is required for the sensitivity measurement. The normal sensitivity of Radio Receiver BC-341-F varies between 1250 and 2250 microvolts input at 3000 cps (30 percent modulation). This is the test input which is required to produce a .4 ma standard output from the radio receiver. The performance of the radio receiver for instrument landing with the Army marker beacon transmitters, Marker Beacon Projector A-1 and Radio Transmitter BC-302 should be judged by the sensitivity of the receiver with a 60 cps modulated signal. The normal sensitivity of the receiver for 60 cps plate modulated signal varies between 15,000 and 40,000 microvolts measured as outlined above. When 60 cps modulation is employed, the relay closing current, as averaged by the direct current meter, will be found to be lower than 0.4 ma. For purposes of measurement, however, 0.4 milliampere is considered standard. The relay should not operate with less than a 15,000 microvolt, 60 cycle modulated signal applied to receiver. With three volts audio frequency (40 cycles to 3000 cycles) applied in series with the 220 volt supply the relay current should not be greater than .1 ma and will normally be about .05 ma.

b. Selectivity should measure as follows:

(1) Tune the receiver accurately to resonance at 75 megacycles, using 30 percent modulation at 3000 cps. Adjust the signal input, employing a 75 ohm dummy antenna, to the level required for an output of 0.4 ma. This value should indicate normal receiver sensitivity.

(2) Set the signal generator frequency at about 70 megacycles and increase the input level two-fold.

(3) Increase frequency slowly until the receiver output is again 0.4 milliampere. Record the frequency at this point.

(4) Continue to increase the frequency beyond resonance until the receiver output falls to the standard value of 0.4 milliampere. Record the frequency at this point.

(5) The difference between values recorded in (3) and (4) is the band width at two-fold (6 db) input.

(6) Repeat the above procedure but increase the signal level ten-fold in st (2). The band width now obtained for a ten-fold (20 db) increase in signal level.

(7) The measured values of band width should be within 40 percent of the following values, and will normally be less for receivers of higher sensitivity due to variation in the regenerative effects of the amplifier Tube VT-153:

Input	Band width
2 x value at resonance (6 db)	1.00 megacycle
10 x value at resonance (20 db)	4.00 megacycles

18. Interstage Measurements

a. Audio frequency measurements are given in the following table which indicates the nature and value of the signal required to produce a receiver output current of 0.4 milliampere and to the point of application of the test voltage. The test voltage is given with respect to chassis. Shielded leads, and an isolating condenser of 0.1 mf should be used:

Point of Application	Nature of Signal (Cycles per Second)	Volts Required For 0.4 ma.
Grid of Tube VT-104	3000	.48
	60	3.4
Plate of Tube VT-153	3000	.54
	60	6.4
Grid of Tube VT-153	3000	.02
	60	2.4

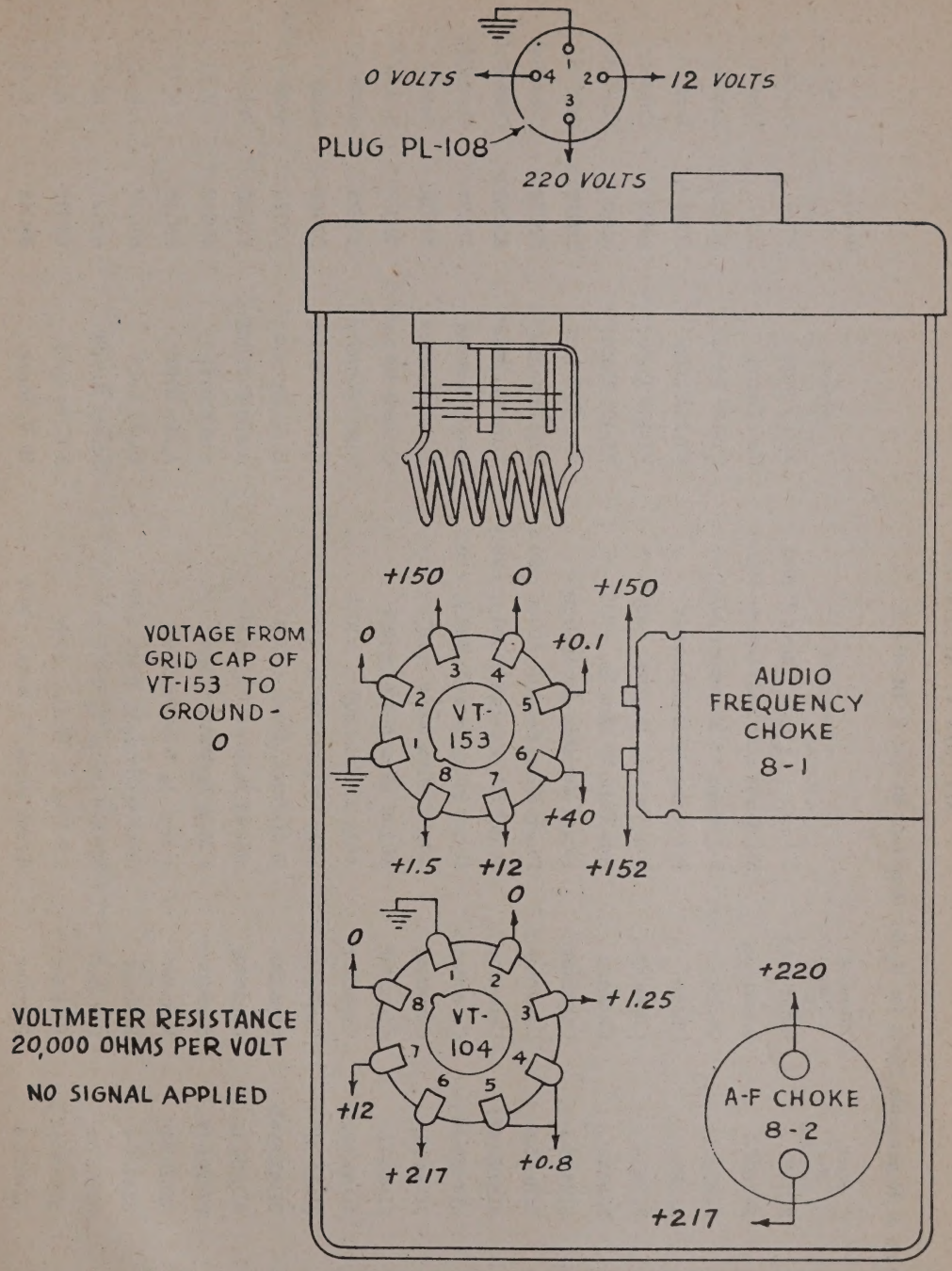


Figure 8 — TERMINAL-TO-GROUND VOLTAGE CHART, RADIO RECEIVER BC-341-F

19. Table of Replaceable Parts for Radio Receivers BC-341-F, BC-357-H

Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
5	3C1067	Inductance	8 Turns #14 Solid Copper-Tinned	Ant. Tuning	20G6	Zenith
6	3C1067-1	Inductance	5⅞ Turns #14 Solid Copper-Tinned	Det. Tuning	20G1	Zenith
7-1	3C339	Choke	R-f choke, 16 Microhenries	VT-153 Plate	5G67	Zenith
7-2	3C339	Choke	R-f choke, 16 Microhenries	VT-153 Diode	5G67	Zenith
8-1	3C343-2	Choke	Iron Core, 23 Henries, +30%—0	VT-153 Plate	95G2	Chicago
8-2	3C343-2	Choke	Iron Core, 23 Henries, +30%—0	VT-104 Plate	95G2	Chicago
9	3D9017-1	Capacitor	17 uuf Variable, Air Dielectric	Ant. Tuning	22G10	Oak
10	3D9075-6	Capacitor	15 uuf Silver Ceramic, 500 v, ±20%	Grid Coupling	22G25	Centralab
11-1	3D9050-48	Capacitor	50 uuf Silver Ceramic, 500 v, ±20%	Plate Coupling	22G24	Centralab
11-2	3D9050-48	Capacitor	50 uuf Silver Ceramic, 500 v, ±20%	Diode Coupling	22G24	Centralab
12-1	3DA4-21	Capacitor	.004 uf Mica, 500 v, ±10%	Screen By-pass	22G19	Solar
12-2	3DA4-21	Capacitor	.004 uf Mica, 500 v, ±10%	Cathode By-pass	22G19	Solar
13-1	3DA1-500-3	Capacitor	.0015 uf Mica, 500 v, ±10%	Audio Coupling	22G21	Solar
13-2	3DA1-500-3	Capacitor	.0015 uf Mica, 500 v, ±10%	Audio Coupling	22G21	Solar
14	3DA500-51	Capacitor	.5 uf Paper, 400 v, ±10%	H. V. By-pass	22G13	Solar
15	3DA34-1	Capacitor	.034 uf Paper, 600 v, ±10%	Audio Coupling	22G22	Solar
16-1	3Z6801-16	Resistor	1 Meg. ¼ Watt, ±20%	Audio Grid	63G18	I. R. C.
16-2	3Z6801-16	Resistor	1 Meg. ¼ Watt, ±20%	Audio Grid	63G18	I. R. C.
17	3Z6756-4	Resistor	560,000 Ohms, ¼ Watt, ±10%	Diode Load	63G17	I. R. C.
18	3Z6727-5	Resistor	270,000 Ohms, ¼ Watt, ±10%	Screen Supply	63G21	I. R. C.
19	3Z6802A2-2	Resistor	2.2 Meg. ¼ Watt, ±10%	VT-104 Grid	63G19	I. R. C.
20	3Z6622-4	Resistor	22,000 Ohms, ½ Watt, ±10%	H. V. Filter	63G15	I. R. C.
21	3Z6010-26	Resistor	1000 Ohms, ¼ Watt, ±10%	VT-104 Cathode	63G12	I. R. C.

Table of Replaceable Parts for Radio Receivers BC-341-F, BC-357-H (Continued)

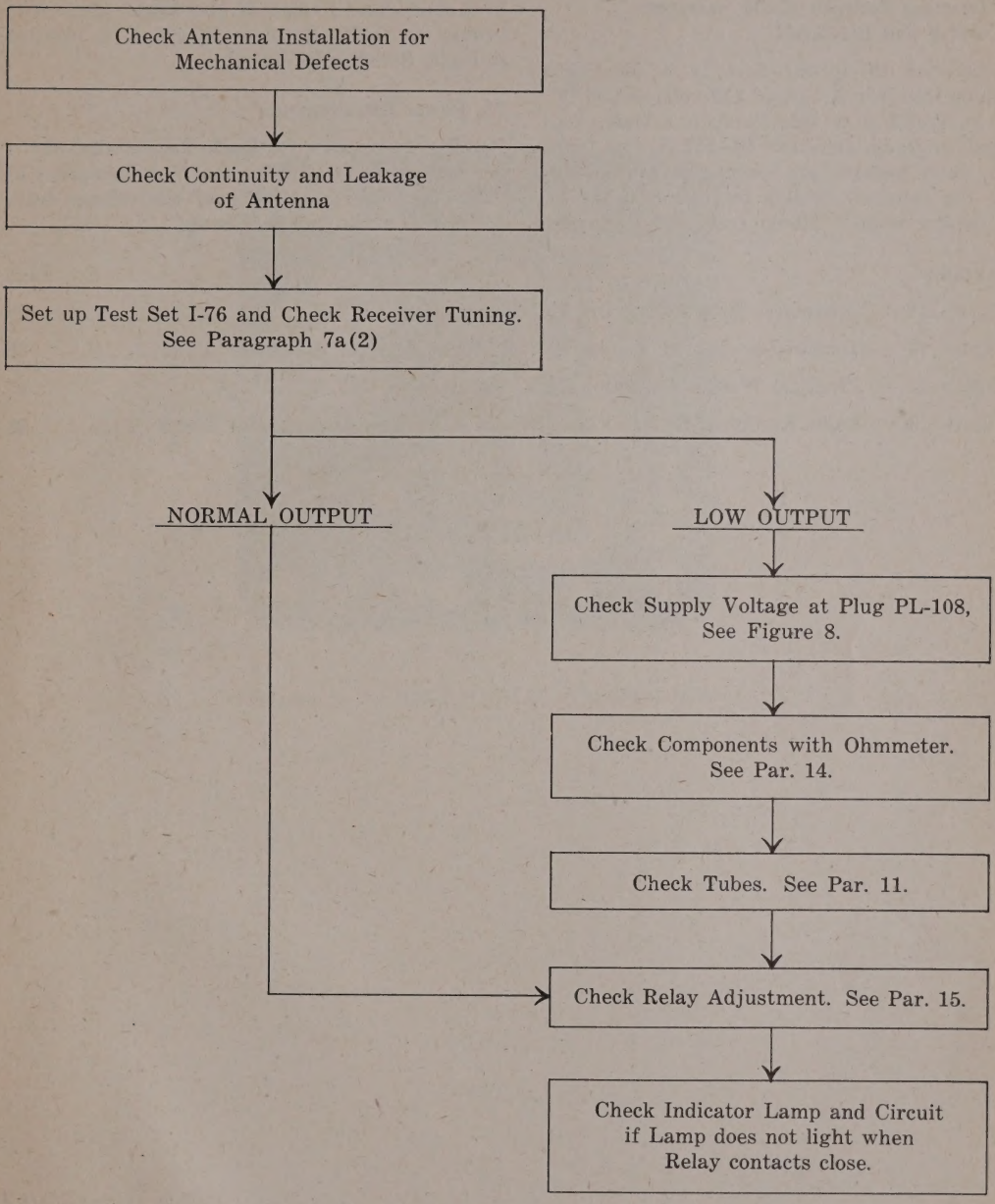
Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
22	3Z6568-4	Resistor	6800 Ohms, ¼ Watt, ±10%	Audio Plate	63G14	I. R. C.
23	2Z7703	Relay	Control Relay BK-35	Indicator Lamp	195G10	G. M. Lab.
24	2Z8761.5	Socket	Octal, 8 Contact	VT-153 Socket	78G4	Amphenol
25	2Z1583	Jack	Single Contact	Ant. Input	SG125	Jones
26	2Z5581-2	Jack	Closed Circuit	Relay Test	SG108	Mallory
27	2Z8788	Socket	Plug Receptacle (50-88)	For Plug PL-108	SG118	Kellogg
28	3D9017-2	Capacitor	17 uuf Variable, Air Dielectric	Det. Tuning	22G11	Oak
29	3D9150-10	Capacitor	150 uuf Mica, 500 v, ±20%	R-f By-pass	22G41	Solar
30	3C9075-3	Capacitor	75 uuf Mica, 500 v, ±10%	Audio By-pass	22G26	Cornell
31-1	3D9500-55	Capacitor	500 uuf Mica, 500 v, ±20%	Heater Circuit	22G27	Solar
31-2	3D9500-55	Capacitor	500 uuf Mica, 500 v, ±20%	R-f By-pass	22G27	Solar
32	2Z8795-8	Socket	Octal, 8 Contact	VT-104 Socket	78G2	Amphenol
33	3Z5356	Resistor	560 Ohms, ½ Watt, ±10%	VT-153 Cathode	63G22	I. R. C.
34	2Z3404	Cap	Relay Jack Cover	Dust Cap	SG64	Zenith
35	2C4341F/B1	Bushing and Terminal	Isolantite Bushing & Terminal	Feed Through	SG116	Zenith
36		Grid Cap	Grid Contact Clip	For VT-153	19G3	Zierick
	6N6515	Shield	Rubber Sleeve	Dust Shield	199G3	Atlantic

20. Manufacturers' Names and Addresses

Code	Name of Manufacturer	Address
ZENITH	Zenith Radio Corporation	6001 Dickens Ave., Chicago, Ill.
OAK	Oak Mfg. Co.	711 W. Lake St., Chicago, Ill.
CENTRALAB	Centralab	900 Keefe Ave., Milwaukee, Wis.
SOLAR	Solar Manufacturing Co.	Bayonne, N. J.
AMPHENOL	American Phenolic Co.	500 S. Throop St., Chicago, Ill.
I. R. C.	International Resistance Co.	401 N. Broad St., Philadelphia, Pa.
ZIERICK	Zierick Mfg. Co.	385 Girard Ave., New York, N. Y.
G. M. LAB.	G. M. Laboratories, Inc.	4326 N. Knox Ave., Chicago, Ill.
CHICAGO	Chicago Transformer Corp.	3501 Addison St., Chicago, Ill.
KELLOGG	Kellogg Switchboard & Supply	6650 So. Cicero Ave., Chicago, Ill.
CORNELL DUBILIER	Cornell-Dubilier Corp.	4377 Bronx Blvd., New York, N. Y.
ATLANTIC	Atlantic India Rubber Works	1453 W. Van Buren St., Chicago, Ill.
MALLORY	P. R. Mallory & Co.	Indianapolis, Ind.
JONES	Howard B. Jones Co.	2300 W. Wabansia Ave., Chicago, Ill.

21. Trouble Location and Remedy Chart

EQUIPMENT NOT SATISFACTORY IN FLIGHT


Check Antenna Installation for Mechanical Defects
Check Continuity and Leakage of Antenna
Set up Test Set I-76 and Check Receiver Tuning. See Paragraph 7a(2)
NORMAL OUTPUT
LOW OUTPUT
Check Supply Voltage at Plug PL-108, See Figure 8.
Check Components with Ohmmeter. See Par. 14.
Check Tubes. See Par. 11.
Check Relay Adjustment. See Par. 15.
Check Indicator Lamp and Circuit if Lamp does not light when Relay contacts close.

PART B

RADIO RECEIVER BC-357-H

22. Differences Between Radio Receivers BC-341-F and BC-357-H

Radio Receiver BC-357-H (24-volt) is identical with Radio Receiver BC-341-F (12-volt) which is treated in PART A of this instruction book, except that in Radio Receiver BC-357-H, the two vacuum tube heaters are connected in series, making the receiver suitable for operation on a 24-volt heater supply. Radio frequency by-pass 31-2 from the + side of the heater circuit to ground in Radio Receiver BC-341-F is omitted in Radio Receiver BC-341-H.

23. Power Requirements

Power requirements for Radio Receiver BC-357-H are 0.15 amps at 24 volts and 7 milliamperes at 220 volts. There is also a small low voltage drain furnished by the indicator lamp.

24. Diagrams

Page

Figure 12 — Schematic Circuit Diagram, Radio Receiver BC-357-H 25

Figure 13 — Terminal-to-Ground Voltage Chart, Radio Receiver BC-357-H 26

Figure 14 — Practical Wiring Diagram, Radio Receiver BC-357-H 27

Figure 15 — Radio Receivers BC-341-F and BC-357-H, Outline Dimensional Sketch. 28

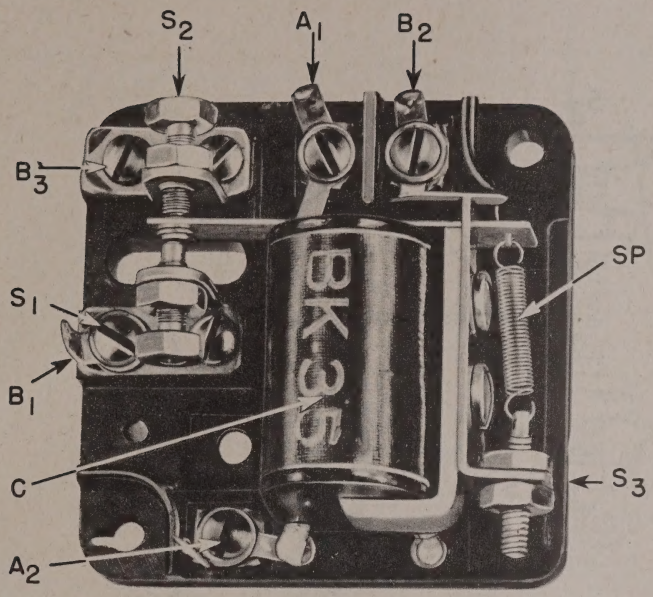


Figure 9 — RELAY BK-35, FRONT VIEW

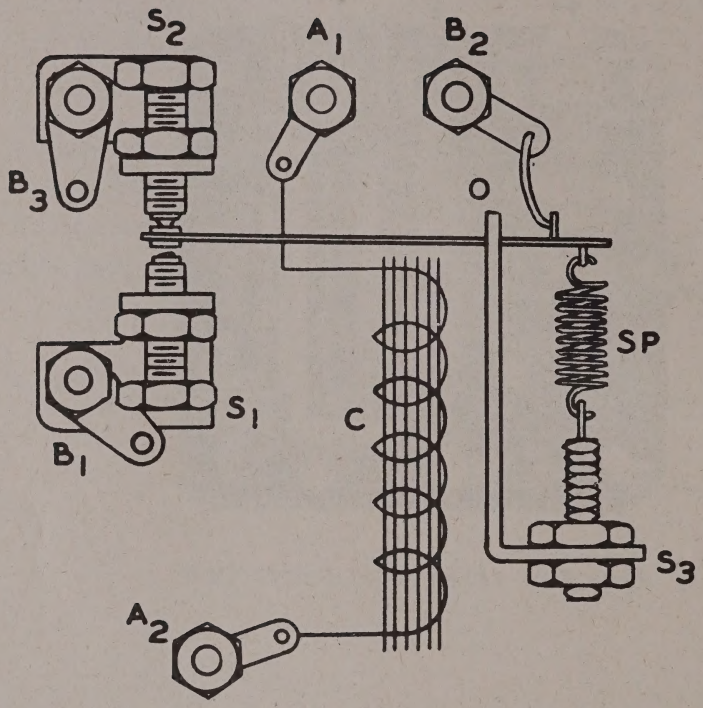


Figure 10 — RELAY BK-35, FUNCTIONAL DIAGRAM

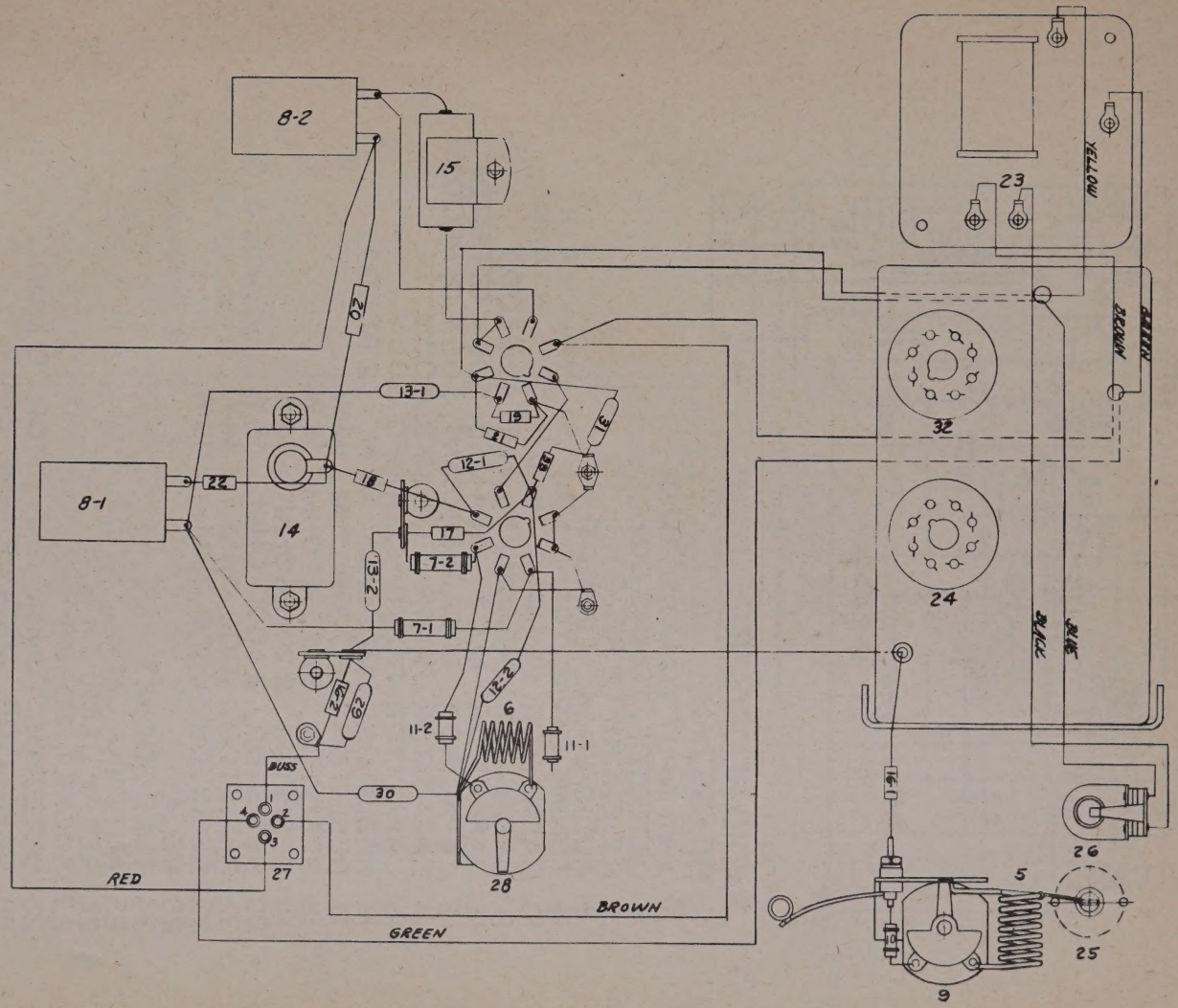
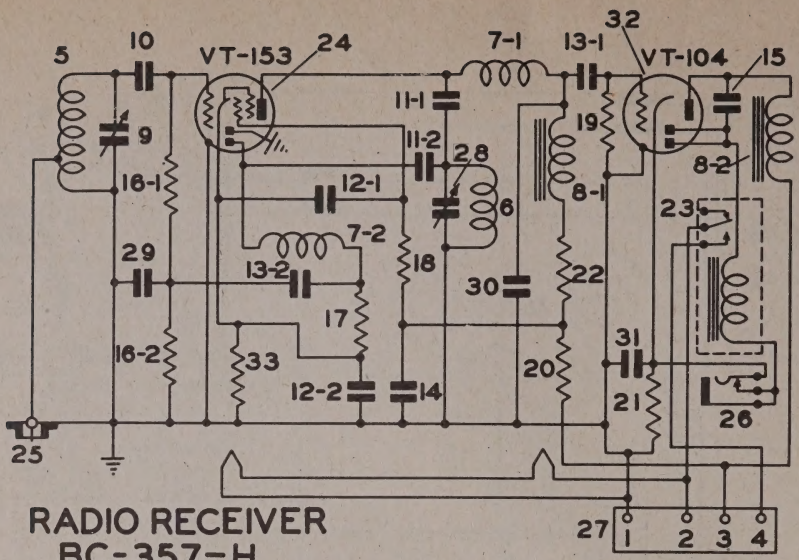


Figure 11 — PRACTICAL WIRING DIAGRAM, RADIO RECEIVER BC-341-F



RADIO RECEIVER BC-357-H

5	ANT. INPUT TRANSFORMER	
6	DETECTOR TUNING COIL	
7	R.F. CHOKE (2 REQ'D.)	
8	AUDIO CHOKE (2 REQ'D.)	
9	TUNING CAPACITOR, 17 MMF.	
10	CAPACITOR, CERAMIC 15 MMF.	
11	CAPACITOR, CERAMIC 50 MMF. (2 REQ'D.)	
12	CAPACITOR, MICA .004 MFD. 500 V. (2 REQ'D.)	
13	CAPACITOR, MICA 1500 MMF. 500 V. (2 REQ'D.)	
14	CAPACITOR, PAPER 0.5 MFD. 400 V.	
15	CAPACITOR, PAPER .034 MFD. 600 V.	
16	RESISTOR, 1 MEGOHM	1/4 W. (2 REQ'D.)
17	RESISTOR, 560,000 OHM	1/4 W.
18	RESISTOR, 270,000 OHM	1/4 W.
19	RESISTOR, 2.2 MEGOHM	1/4 W.
20	RESISTOR, 22,000 OHM	1/2 W.
21	RESISTOR, 1000 OHM	1/4 W.
22	RESISTOR, 6800 OHM	1/4 W.
23	RELAY	
24	TUBE SOCKET	
25	ANTENNA JACK	
26	RELAY JACK	
27	SOCKET SO-88	
28	DETECTOR TUNING CAPACITOR, 17 MMF.	
29	CAPACITOR, MICA 150 MMF. 500 V.	
30	CAPACITOR, MICA 75 MMF. 500 V.	
31	CAPACITOR, MICA 500 MMF. 500 V.	
32	TUBE SOCKET	
33	RESISTOR, 560 OHM	1/4 W.

Figure 12 — SCHEMATIC CIRCUIT DIAGRAM, BC-357-H

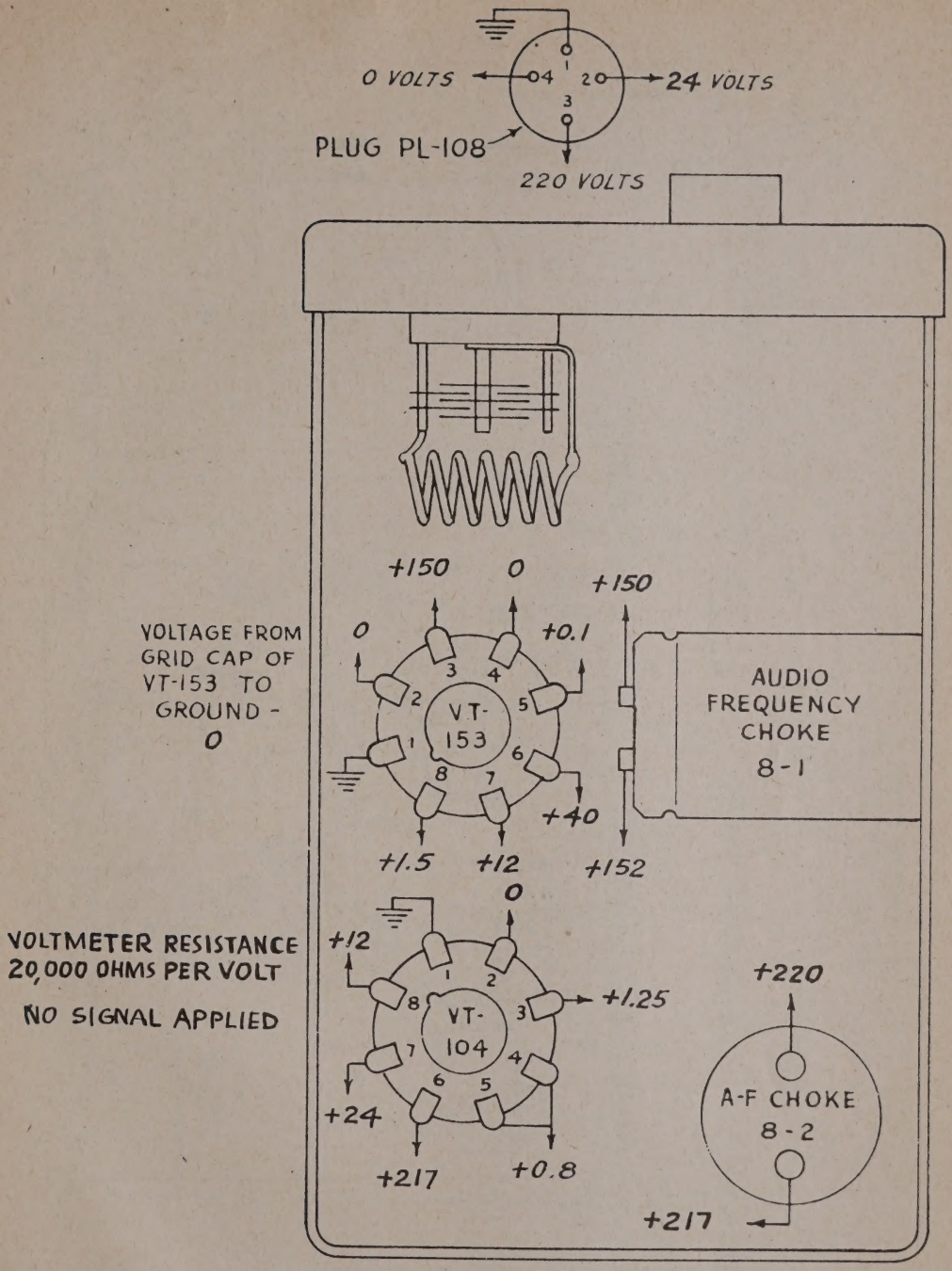


Figure 13 — TERMINAL-TO-GROUND VOLTAGE CHART, RADIO RECEIVER BC-357-H

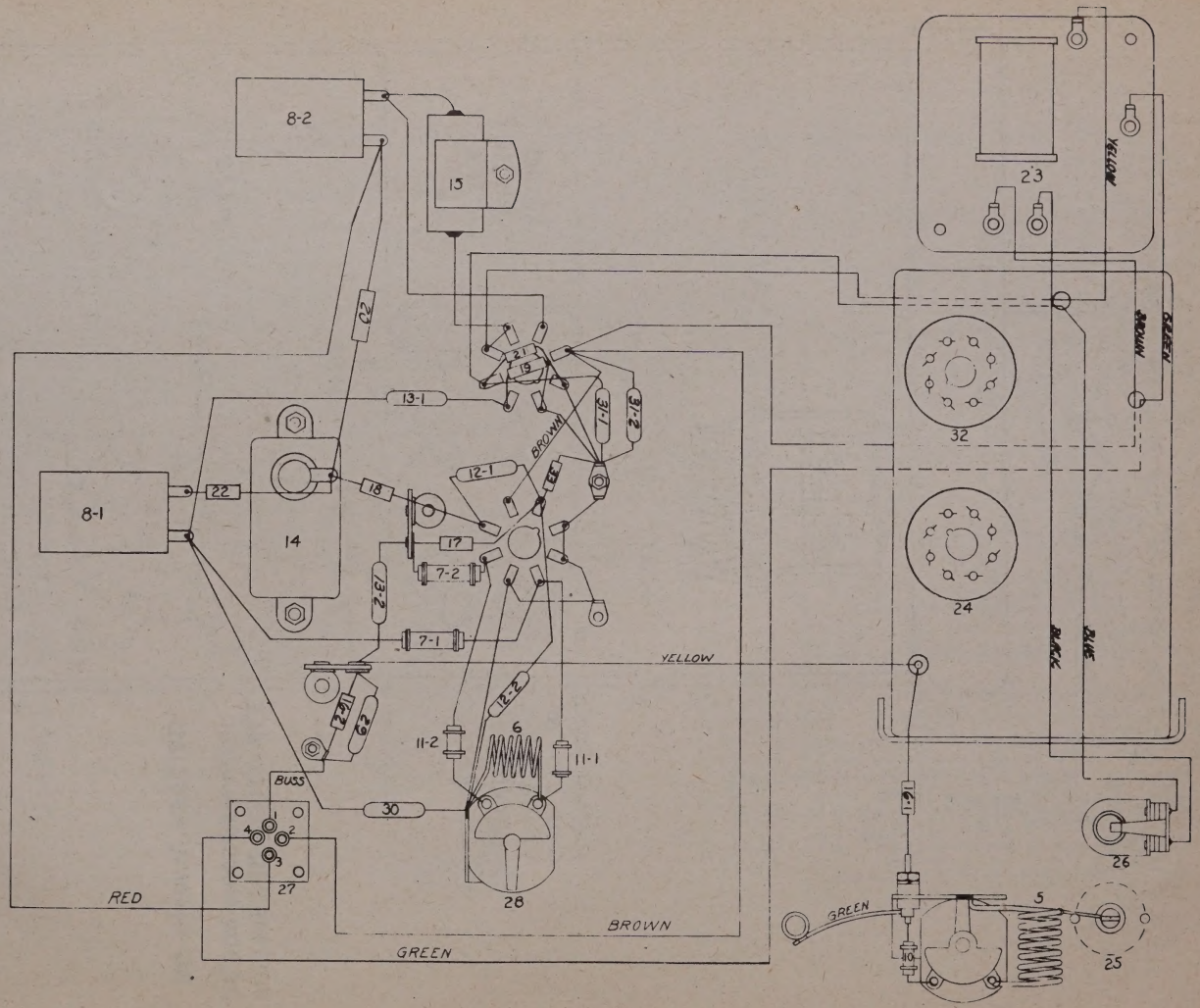


Figure 14 — PRACTICAL WIRING DIAGRAM, RADIO RECEIVER BC-357-H

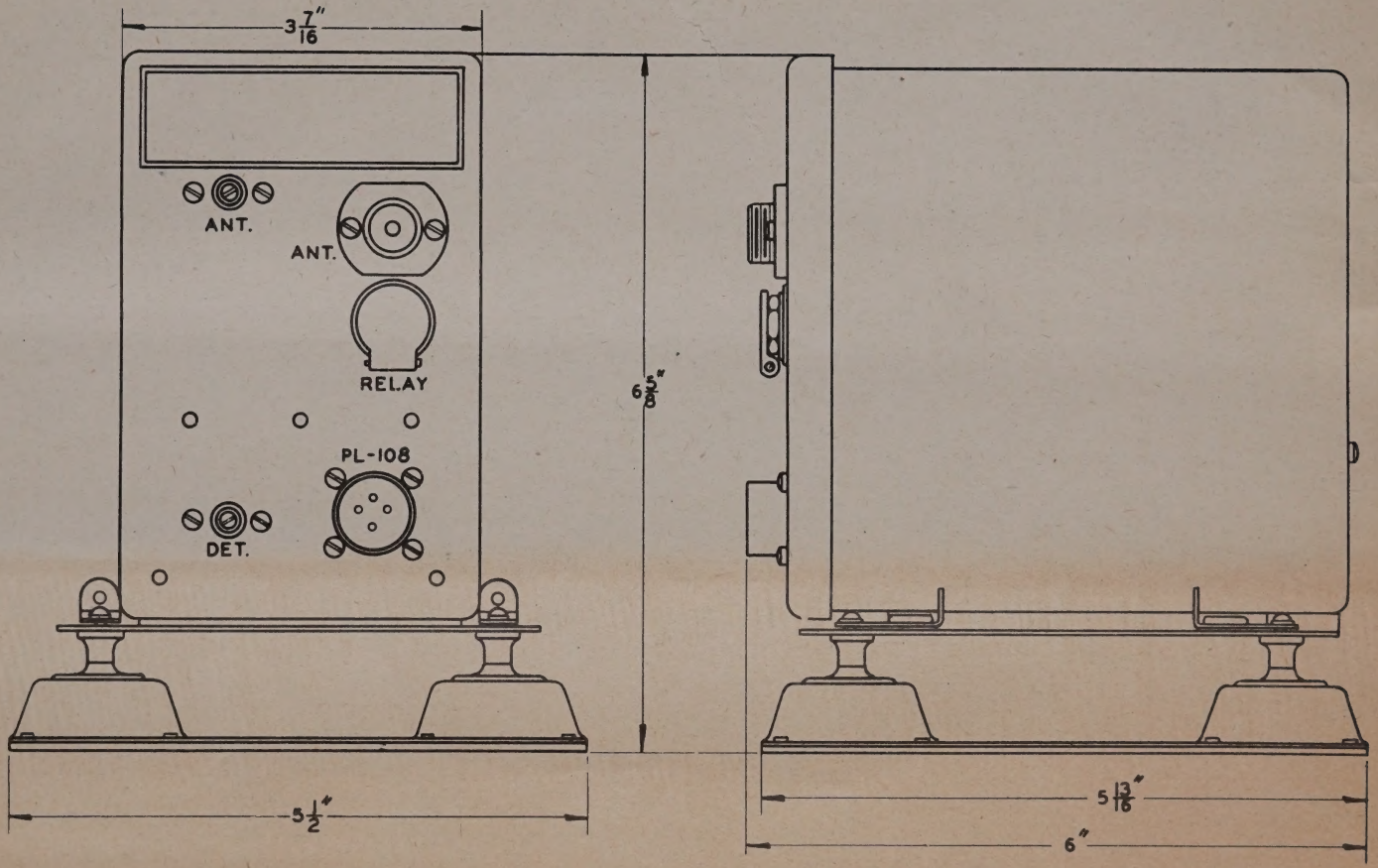


Figure 15 — RADIO RECEIVERS BC-341-F AND BC-357-H, OUTLINE DIMENSIONAL SKETCH.